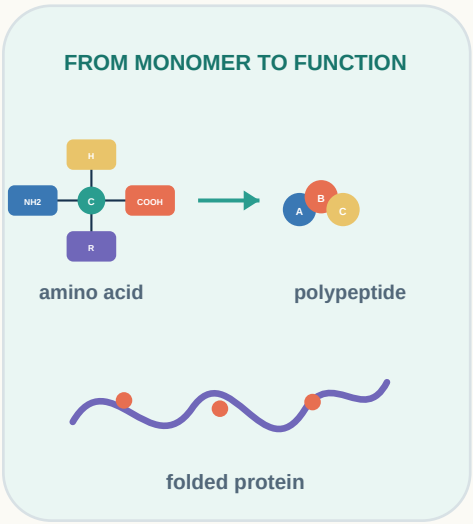
AP BIOLOGY | UNIT 1

TOPIC 1.7

Proteins

Amino acid sequence drives folding, and a protein's three-dimensional shape determines its function.



THE CORE CAUSAL CHAIN

SEQUENCE
amino acid order

→

R GROUPS
chemical interactions

→

3D SHAPE
specific folding

→

FUNCTION
specific job

BY THE END, YOU SHOULD BE ABLE TO...

1. Identify amino-acid parts and peptide bonds.
2. Connect amino-acid sequence to protein folding.
3. Explain how shape, environment, and denaturation affect function.

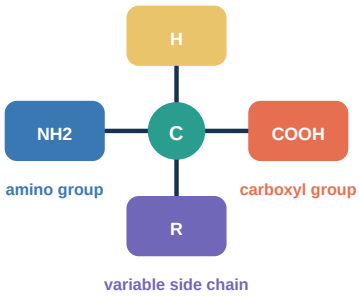
BIG IDEA

Changing even one amino acid can alter R-group interactions, folding, shape, and therefore protein function.

1 Amino acids to polypeptides

Amino acids share a common backbone; variable R groups give each monomer distinct chemical properties.

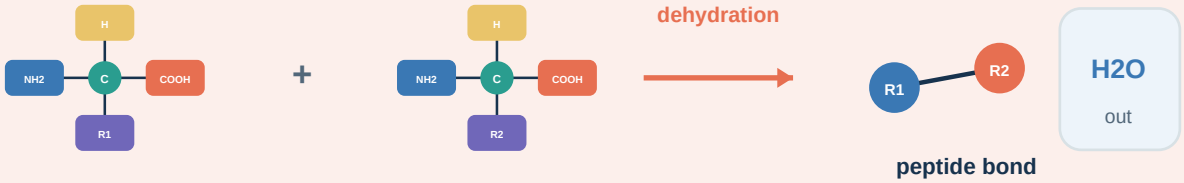
THE GENERAL AMINO ACID



WHY THE R GROUP MATTERS

R groups may be nonpolar, polar, acidic, basic, or sulfur-containing. Their chemistry determines which interactions can form as the chain folds.

FORMING A PEPTIDE BOND



PRIMARY STRUCTURE = AMINO ACID SEQUENCE



A specific sequence creates a specific set of possible interactions.

AP SCOPE NOTE

Know amino-acid structure, dehydration synthesis, peptide bonds, and why primary sequence matters.

2 Folding creates function

Primary sequence guides higher levels of structure through interactions among the backbone, R groups, and water.

1 PRIMARY



The linear amino-acid sequence linked by peptide bonds.

2 SECONDARY



Local alpha helices and beta sheets stabilized by backbone hydrogen bonds.

3 TERTIARY



The overall three-dimensional shape of one polypeptide.

4 QUATERNARY



The arrangement of two or more polypeptide subunits.

INTERACTIONS THAT SHAPE A PROTEIN

HYDROGEN	IONIC	DISULFIDE	HYDROPHOBIC
interaction	interaction	interaction	interaction

SHAPE CONTROLS FUNCTION



Binding depends on a matching three-dimensional shape. Heat, extreme pH, or altered salt conditions can disrupt interactions, causing denaturation and loss of function.

COMMON ERROR

Denaturation changes higher-level shape, not the peptide-bond sequence of primary structure in typical AP Biology examples.